

# Extended Summaries

## 1st European Pesticide Residues Workshop

### Pesticides in Food and Drink

*The following extended summaries are based on papers presented at the above meeting, held at Alkmaar, The Netherlands on 10–12 June 1996. The summaries published here are entirely the responsibility of the authors and do not necessarily reflect the views of the Editorial Board of Pesticide Science.*

#### Intake of DDT Residues from Selected Meals of the Aragonese (NE Spain) Diet

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##### Introduction

In order to assess potential health risks arising from the presence of contaminants in the food supply, the extent to which actual dietary intakes approach or exceed a toxicologically acceptable daily intake (ADI) or provisional tolerable weekly intake (PTWI) of certain materials should be determined. In this way, the Joint FAO/WHO Food Contamination Monitoring Programme expressed the opinion that the use of total diet studies for monitoring levels of pesticide residues should be encouraged, and published the guidelines for conducting such studies.<sup>1</sup>

Monitoring by means of such studies is being practised increasingly in various developed countries i.e. USA,<sup>2</sup> New Zealand,<sup>3</sup> Switzerland,<sup>4</sup> United Kingdom,<sup>5</sup> The Netherlands,<sup>6,7</sup> Finland<sup>8</sup> and Japan.<sup>9</sup>

In Spain, a total diet study was published by Carasco *et al.*<sup>10</sup> dealing with raw foods. Recently, Herrera *et al.*<sup>11</sup> made an attempt to estimate the dietary intake

of residues of organochlorine pesticides from a selected number of ready-to-eat foods, and Urieta *et al.*<sup>12</sup> published an estimate of the dietary intake of different contaminants (including organochlorine pesticides) and nutrients from the total diet of the Basque Country (Northern Spain).

Although the use of DDT was banned in most European countries in the 1970s, residues of this lipophilic compound can still be found in foods. This extended summary reports data concerning intake of DDT and its metabolites from ready-to-eat meals as part of the Aragonese diet, from December 1991 to June 1994.

##### Materials and methods

**Composition of the meals.** Between December 1991 and June 1994, samples of ready-to-eat food were taken randomly from five different catering establishments in Zaragoza (Aragon, Spain). Samples were classed into the eight component groups in Table 1.<sup>11</sup> A total of 281 samples were analysed.

**Chemical analysis.** DDT residues were extracted with light petroleum distillate<sup>13</sup> or ethyl acetate,<sup>14</sup> cleaned-up by gel permeation chromatography and determined by capillary gas-liquid chromatography with electron capture detector (GLC-ECD). Details of the analytical procedure were described elsewhere.<sup>15</sup>

**Estimation of DDT dietary intake.** The dietary intake of DDT-like compounds was estimated by multiplying the residue level in the food by the amount of food consumed.<sup>16,17</sup> The value of one-half limit of detection was assigned to samples with non-detectable levels of residues.<sup>18</sup> Total intake of residues of DDT was then

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TABLE 1

Composition of Different Meals and Number of Samples analyzed

| Meal Components                | Number of samples |
|--------------------------------|-------------------|
| <i>Legumes</i>                 | 22                |
| Lentil                         | 8                 |
| Beans                          | 7                 |
| Chickpeas                      | 7                 |
| <i>Potatoes</i>                | 20                |
| Cooked                         | 10                |
| Potato chips                   | 10                |
| <i>Vegetables</i>              | 47                |
| Salad                          | 9                 |
| String beans                   | 9                 |
| Green peas                     | 9                 |
| Leaf beet/borage               | 10                |
| Stewed vegetables              | 10                |
| <i>Fruits</i>                  | 30                |
| Apples/pears                   | 8                 |
| Oranges/mandarin oranges       | 11                |
| Other fruits                   | 11                |
| <i>Cereal-based foods</i>      | 32                |
| Macaroni/spaghetti             | 8                 |
| Cooked rice                    | 8                 |
| Paella (Spanish rice dish)     | 6                 |
| Croquettes                     | 10                |
| <i>Meat</i>                    | 77                |
| Beef steak                     | 10                |
| Roast beef                     | 10                |
| Fried pork                     | 12                |
| Fried lamb                     | 10                |
| Grilled breast of chicken      | 8                 |
| Roasted leg quarter of chicken | 9                 |
| Hamburgers/meat balls          | 8                 |
| Cooked sausages                | 10                |
| <i>Eggs</i>                    | 29                |
| Potato omelette                | 9                 |
| Fried eggs                     | 10                |
| Cooked eggs                    | 10                |
| <i>Fish</i>                    | 24                |
| Non-fatty fish                 | 12                |
| Fatty fish                     | 5                 |
| Fresh-water fish               | 7                 |

obtained by summing the intakes from all food groups. The recommended guidelines of the Codex Committee on Pesticide Residues for predicting dietary intake of pesticide residues were followed.<sup>19</sup>

### Results and discussion

Critical assessment of dietary exposure is vital to obtain fundamental data concerning the safety of foods, problems and trends in the intake of chemicals and to identify the sources of unusual residues.

In a previous paper<sup>11</sup> we reported the contamination pattern of samples by residues of DDT and its metabolites DDE and DDD, both as *op'* and *pp'* isomers. DDT

TABLE 2

Mean and Maximum Levels of DDT-like Compounds (ng g<sup>-1</sup> on a Wet Weight Basis) and Daily Intakes (EDI) (ng per Person per Day) from Meals of the Aragonese Diet

| Meals              | Mean <sup>a</sup> level | Maximum level | Mean EDI | Maximum EDI |
|--------------------|-------------------------|---------------|----------|-------------|
| Legumes            | 0.8                     | 2.4           | 6.8      | 20.9        |
| Potatoes           | 1.7                     | 7.8           | 147.8    | 694.0       |
| Vegetables         | 0.1                     | 0.1           | 18.0     | 18.0        |
| Fruits             | 0.2                     | 2.1           | 46.3     | 596.7       |
| Cereal-based foods | 1.3                     | 2.79          | 32.4     | 69.6        |
| Meat               | 3.8                     | 14.7          | 664.5    | 2541.9      |
| Eggs               | 4.5                     | 9.2           | 151.2    | 309.2       |
| Fish               | 3.1                     | 10.3          | 123.5    | 412.7       |
| Total intake       |                         |               | 1190.7   | 4663.0      |

<sup>a</sup> Mean level of total samples.

residues were detected in 13.2% of analysed samples, *pp'*DDE being the most abundant metabolite (12.5%).

Mean and maximum estimated DDT daily intakes, as well as mean and maximum levels of DDT residues, are reported for each food group in Table 2. These were far below the FAO/WHO maximum acceptable daily intake (ADI) of DDT, established as 1.2 mg day<sup>-1</sup> for a body weight of 60 kg.<sup>20</sup>

Our values are far below those of Carrasco *et al.*,<sup>10</sup> who estimated a mean daily intake of 78.4 µg of DDT-like compounds per person per day, but it must be stressed that their study corresponds to the years 1971–1972, when the use of DDT was still not banned.

Estimates published recently quote values only slightly higher than our own. Thus, Herrera *et al.*<sup>11</sup> estimated a daily intake of 1.2 µg per person per day from a selected number of food classes, while Urieta *et al.*<sup>12</sup> calculated mean and maximum intakes of 1.4 µg and 9.6 µg per person per day, respectively.

Our results were also compared with those from other countries. On the whole, the estimated DDT-like compounds intake is similar or slightly lower than those reported by developed countries as follows: (µg per person per day) Japan (1.42);<sup>9</sup> USA (1.23);<sup>20</sup> New Zealand (7.1);<sup>3</sup> Switzerland (1.7)<sup>4</sup> and The Netherlands (6.0).<sup>6</sup>

In conclusion, it can be said that dietary intake of DDT residues from the Aragonese diet is well below established safety standards and is probably totally harmless.

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